

THE JUMPING SPIDERS (ARANEAE: SALTICIDAE) OF THE VIRGINIA PENINSULA¹

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ABSTRACT: Thirty species representing 18 genera of Salticidae are recorded from the Virginia Peninsula. Habitat and natural history information for each species is presented. Some salticids on the peninsula occupy diverse habitats while other species appear to confine themselves to more restricted environments. The most abundant salticid was *Hentzia palmarum*. *Metaphidippus galathea* and *Platycriptus undatus* were most widely distributed species. Salticids reported in Virginia for the first time are *Phidippus princeps*, *P. otiosus*, *Thiodina sylvana*, *Sitticus fasciger* and *Zygoballus sexpunctatus*.

A few studies concerning the spider fauna of Virginia have been published. The earliest record of occurrence was by John Banister between 1678 and 1692 (Ewan and Ewan, 1970). More recently, McCaffrey and Hornsburgh published three studies concerning spiders in apple orchards in central Virginia. Their assessment of spider populations in an unsprayed orchard was published in 1977 followed (1978) by laboratory feeding studies performed to evaluate potential effects of predaceous spiders on insect residents of apple orchards. Later (1980), a comparison was made between the spider populations in abandoned and commercial orchards; 68 species were identified.

Dowd and Kok (1981), and McPherson *et al.* (1982) considered spider and other arthropod predation on the curculionid beetle, *Rhynocyllus* sp., in a soybean cropping system in Virginia. Holsinger (1982) reported on the spider cave-fauna in Burnsville Cove. The efficiency of limb-beating for capturing various spider families in apple orchards is discussed by McCaffrey and Parrella (1984).

In the above listed works, the Salticidae have been given little attention. George and Elizabeth Peckham are the acknowledged early authorities on the Attidae (Salticidae). Their classic publications appeared in 1889 and 1909. Using this literature as a base, a faunal record of the jumping spiders (Salticidae) of the Virginia Peninsula, including natural history data and new state records, is presented.

The Virginia Peninsula is located on the eastern coastal plain of Virginia. It is bordered to the east by Chesapeake Bay and to the south by the James River. The Colonial Parkway served as a convenient northern boundary for the collecting area. The study area encompassed approximately 250 square miles. Vegetatively, the peninsula is a broad-leaved and needle-leaved forest consisting primarily of oak (*Quercus* sp.), hickory (*Carya* sp.) and pine (*Pinus* sp.). Other common deciduous trees include black cherry (*Prunus serotina*

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Ehrhart), sweet-gum (*Liquidambar styraciflua* L.), maple (*Acer rubra* L.) and holly (*Ilex* sp.). Prevalent shrubs and vines composing the forest understory are bayberry (*Myrica* sp.), honeysuckle (*Lonicera* sp.) and smilax (*Smilax* sp.). The peninsula has a flat terrain with local relief formed by terrace and alluvial embayments. Geologically, the land consists of quarternary and upper tertiary non-resistant sedimentary rock (U.S. Dept. of Interior Geological Survey, 1970) resulting in yellowish sandy loam soil (Paullin, 1932). Numerous ecotopes exist on the peninsula from forests and open fields to marshes and sand beaches. Each of these, in turn, furnish a multitude of microhabitats.

MATERIALS AND METHODS

Collecting Methods. The Salticidae are known to dwell in a wide variety of habitats ranging from man-made structures to fields and forests. Twelve collecting sites were chosen at random across the Virginia Peninsula. These sites included many diversified habitat areas. Each site was visited approximately four times from mid-May to October 1983.

A sweep net was used to collect spiders from tall grasses and lower ground cover, such as honeysuckle (*Lonicera* sp.) and wild grape (*Vitis* sp.). Using a wooden stick to strike small branches of trees and shrubs, spiders were dislodged and captured on a white canvas cloth covering a 57 cm diameter metal ring (umbrella net). Specimens were collected from pines (*Pinus* sp.), black cherry (*Prunus serotina* Ehrhart), sweet-gum (*Liquidambar styraciflua* L.), red maple (*Acer rubra* L.) and a variety of oaks (*Quercus* spp.). Saplings of these as well as low shrubs, especially bayberry (*Myrica*, sp.), were common habitats for many salticids. Larger trees were stripped of loose bark and examined for presence of salticids and their hibernacula. Man-made structures, such as picnic shelters, houses, sheds and brick piles, were carefully examined for salticids.

All salticids were captured in clear plastic vials on which locality, habitat, date and method of capture were recorded. Spiders were then transported to the laboratory for identification.

Laboratory rearings. Immature spiders were housed in glass or plastic tubes, ranging from 1 x 9 to 2 x 13 cm, stoppered with cotton. This provided air to the spider and allowed easy access for feeding and watering. Water, which the spiders readily accepted, was administered with a glass pipette at least once a week. Specimens were fed approximately twice a week. Fruit flies (*Drosophila* sp.) and meal worms (*Tenebrio* sp.) served as major food items. A strip of paper with collecting data was placed inside the tubing. This also gave the spiderling a rough surface for molting. Egg deposition and molting dates were recorded daily. The spiders were kept under artificial lights and maintained at room temperature.

Laboratory examination. Mature spiders, either captured in the field

or raised in the laboratory, were killed and preserved in glass vials with 70% ethyl alcohol (ETOH). All specimens were microscopically examined, identified and labeled. The specimens are stored in the Invertebrate Collection at Midwestern State University.

RESULTS

Habitat distributions of salticids on the peninsula shows a diversity for some species while others appear to be confined to more restricted environments. Habitat determination for each reported species (in numbers greater than three) was based on 50% or greater occurrence in a particular ecotope. Table 1 lists the species found in each habitat. Approximately one-third (seven species) of the salticids were found in multiple habitats. Six species were found only on trees and three species in open fields. Man-made structures and dense shrubbery and vines each harbored two different species. In all of these habitats, the greatest concentrations of spiders were found in sunny areas, perhaps allowing the salticids to maximize their keen eyesight for capturing prey.

Collection sites offering the widest variety of habitats harbored the most diverse salticid populations. For example, site one, furnishing all available types of habitat, had 16 species. At the other extreme, four species were collected at site two, a sandy beach lacking man-made structures and dense vegetation.

Species Accounts

Natural history data, including habitat, molting and egg deposition appear in the following species accounts.

(1) *Admestina tibialis* (C.L. Koch). -A single immature specimen was found on a pine sapling on 1 October.

(2) *Ballus youngii* Peckhams. -On 5 January 1984, a single immature specimen was found under tree bark in a hibernaculum. Peckham and Peckham (1909) report Young as stating, "These spiders are found at this season (November) under the bark of trees.... The spider is so nearly of the bark color, and so small, that we often overlook the speck in the center of the envelope, supposing it to be merely the empty tube or cell of some young spider." This may explain our few records of *B. youngii* on the peninsula.

(3) *Eris aurantia* (Lucas). -Eight of the 13 specimens captured were taken from sundry vines and shrubs. Three males reared in the laboratory matured on 21, 22 and 24 June. Other adult males were collected between 27 June and 3 August. Adult females were found between 14 July and 17 August. An immature female collected on 13 July molted to maturity 17 July. One male was taken while eating a jumping plantlouse (Homoptera:

Psyllidae). Immature specimens reared in the laboratory molted and matured at approximately the same time as counterparts in the field. The data indicate that *E. aurantia* males matured prior to the females, with the first mature male appearing on 21 June and the females following nearly a month later on 14 July.

(4) *Eris militaris* (Hentz), *sensu* Maddison, 1986. -Kaston (1981) reports this species is common in shrubbery and tall grasses. Of the nine specimens captured, four were dislodged from saplings, one was swept from ground coverings and four were found overwintering under tree bark in hibernacula on 5 January 1984. One male reared in the lab matured on 30 August. Two adult males were obtained on 23 August and 28 September. On 28 September and 18 October mature females were found. All four of the overwintering spiders were adult females discovered at various sites. Aggregations of hibernating adult males and penultimate females in numbers up to 40 have been recorded by Kaston (1981).

(5) *Habrocestum pulex* (Hentz). -Two of the four specimens were found on man-made structures (a picnic table and bricks). One adult male was found on 8 June. A penultimate male molted on 18 June. A pair of adults was observed in close proximity on the bark of a fallen tree and collected on 23 June.

(6) *Hentzia mitrata* (Hentz). -All *H. mitrata* taken were dislodged from several types of deciduous trees. This is consistent with observations by Kaston (1981). Mature females were captured between 6 June and 3 August. One reared female matured on 3 October. Only two mature males were collected (13 June and 11 July).

(7) *Hentzia palmarum* (Hentz). -This common spider was found on a variety of shrubs and vines, most frequently bayberry. Mature and immature spiders of both sexes were captured throughout the collecting period from May to October. Immatures reared in the lab molted and matured at different times. One adult female was found overwintering on 5 January 1984.

The highest concentration (65%) of *H. palmarum* was at three sites located in the immediate vicinity of water. Presumably the spiders were feeding on some type of aquatic insect.

(8) *Lyssomanes viridis* (Walckenaer). -Habitat data indicate that *L. viridis* preferred broad-leaved trees close to the ground. Mature females were obtained between 15 June and 22 August. No males were found. One female, captured on 11 July, laid two groups of eggs. The first was deposited on 21 July, and contained 20 eggs 0.7 mm in diameter. The eggs were scattered inside a very lightly spun sac. Spiderlings, 1.0 mm in length, hatched on 20 August. They did not survive past the first instar. A second egg sac containing 32 eggs was deposited on 6 August but none of the eggs hatched. This tightly woven egg sac appeared more conventional, with eggs clumped together inside.

Great numbers of young *Lyssomanes* were noticed in the field on 8, 17, 22, and 23 August at various sites. Many of these were returned to the lab for rearing. Despite their acceptance of food and water, none of the spiderlings survived to maturity. These life history observations correspond to those of Richman and Whitcomb (1981) of this species on *Magnolia* in Florida.

The above represents the second record of *L. viridis* in Virginia. In 1979, Shear reported this spider in Williamsburg. Prior to this its northern known limit was Alamance County, North Carolina. According to Galiano (1980), this species is distributed throughout the southeastern United States.

(9) *Maevia* sp. -Four immature specimens of *Maevia* were found between 13 June and 17 August in varied habitats. Since they did not survive to adults, specific identification was not possible. Based upon general morphology and distribution, they were probably *M. inclemens* (Walckenaer).

(10) *Marpissa lineata* (C.L. Koch). -Three females, collected between 8 June and 22 July, were captured: one on a picnic table, one under a box and one hanging dead on an orb web.

(11) *Marpissa pikei* (Peckhams). -Kaston (1981) reports this species as readily swept from tall grasses, especially along seashores. Two mature males swept from grassy fields were both taken at one location on 22 August.

This long-bodied spider was observed to rest by extending the first two pair of legs anteriorly and the hind pairs posteriorly. Stretching out in this position probably allows the spider to blend in with grass blades, providing protection from predators.

(12) *Metacyrba taeniola* (Hentz). -Four specimens (three males and one female) were discovered either on or in a house between 14 June and 20 July.

(13) *Metaphidippus exiguus* (Banks). -This species dwells on young conifers. Some were obtained from various other saplings and shrubs. Wayne Maddison, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (letter dated 14 March 1984), indicates that all members of the *M. flavipedes* group (including *M. exiguus*) prefer pine. Two immature females molted to maturity on 20 and 29 June. Mature females were taken in late September and early October. Even though 13 females were collected, only three adult males were found.

(14) *Metaphidippus galathea* (Walckenaer). -The majority of the specimens (32 of 53) were collected in grassy fields. The remaining were found on trees and shrubs. Four males reared in the lab matured on 29 July, 3 October, and two on 6 October. All females captured were mature. Horner and Starks (1972) reported more than one-half of the specimens collected in the fall in Oklahoma were mature males and females.

M. galathea was the most widely distributed salticid found on the peninsula. Maddison (personal communication) suggests this spider is a field dweller. Sixty percent of the *M. galathea* found were in grass with the remainder dwelling on a variety of other plants.

(15) *Metaphidippus protervus* (Walckenaer). -Twenty-seven individuals were collected from a variety of small trees, vines and shrubs. Only three were males, all found in June. Mature females appeared between 18 August and 29 October. On 18 August, eight males were taken at a single location from sassafras saplings.

Maddison (personal communication) found *M. protervus* commonly dwelling in forest understory. The data concur with our findings.

(16) *Phidippus audax* (Hentz). -Two mature spiders were collected, one on a house, the other on a vine, on 30 April and 7 July, respectively. Three overwintering immature specimens were found under tree bark on 4 January 1984. Two molted to maturity in approximately one month, a male followed by a female.

P. audax was frequently observed on leaves of shrubs, scanning adjacent leaves for prey, but not captured.

(17) *Phidippus clarus* Keyserling. -Six specimens were taken while sweeping weedy fields. Two of each sex were collected from honeysuckle vines and conifers. Adult females were found on 2, 15, and 22 August. On 17 August, a mature male and five females were discovered at three different sites. One captured penultimate male molted on 16 July. A female was caught with prey, an assassin bug (Hemiptera, Reduviidae).

Phidippus clarus was found on the peninsula more often than any other species of *Phidippus*. This may be due to the easily surveyed habitat occupied by *P. clarus*. Some *Phidippus* are known to dwell high in trees and may have escaped capture.

(18) *Phidippus mystaceus* (Hentz). -None of this species was found during the major collecting period. During winter collections, three females were found, each at a separate location, and were preserved. Three others were found in adjacent hibernacula and taken to the lab for observation. Approximately three weeks later one was observed outside the hibernaculum, one female was found dead in the hibernaculum, and of the remaining two, one was eventually cannibalized by the other. An egg sac of the surviving female was discovered on 19 March 1984. Second instar spiderlings were initially observed out of the sac on 20 April 1984.

Kaston (1981) reports *P. mystaceus* as rare. Collection records of this study also indicate the species is scarce. Since it was found overwintering but not in summer collecting, its presumed rarity may be attributed to successful camouflage.

(19) *Phidippus princeps* (Peckhams). -Two penultimate males were

collected on 18 and 29 October, one by sweeping a field and the other on a shrub. Both spiders molted between mid-December and early January, 1984.

This is the first record of *Phidippus princeps* in Virginia. Richman and Cutler (1978) report records of the species from Massachusetts, New York, Kentucky, Connecticut, Iowa, Missouri, Minnesota and Texas.

(20) *Phidippus otiosus* (Hentz). -Two specimens were obtained: an adult female found on holly, 20 July, 1983 and on 10 October, a mature male discovered on a magnolia tree.

This species represents a new record for Virginia. The spider has been reported from Alabama, Florida, Georgia, Maryland and Washington, D.C. (Richman and Cutler, 1978).

(21) *Phidippus whitmani* Peckhams. - Kaston (1981) reports males of this species hopping about on exposed rock surfaces. A single mature male was captured on 15 June while it was jumping in a sunny area of leaf litter. Several penultimate male spiders were captured on leaf litter and thought to be *P. whitmani*. They never matured, and positive identification could not be made. These were the only salticids consistently found on leaf litter.

(22) *Platycryptus undatus* (DeGeer), *sensu* Hill, 1979. -Of the 18 specimens examined only three were taken during summer collecting. Two were discovered on pine bark and the third on a shed. The remaining 15 were found overwintering in varying numbers in hibernacula under the bark of upright pine trees between 2 and 5 January 1984. From one to nine spiders were observed under single sections of bark. Examination of hibernacula retrieved in the field revealed: a single mature female; two instances of mature pairs; and a group of six composed of five adults (two males; three females) and one immature spider. Worley and Pickwell (1931) reported similar instances in Nebraska.

The apparent scarcity of this spider in the warmer months compared with its relative abundance in the winter was probably due to camouflage. The preferred habitat for *P. undatus* was pine tree bark which the spider's coloration closely matches. This species was probably overlooked during the spring and summer.

(23) *Sarinda hentzi* (Banks). -One penultimate male was dislodged from bayberry on 27 June. The apparent scarcity of this and other ant mimicking species may have resulted from mistaking the spiders for ants.

(24) *Sitticus fasciger* (Simon). -A single female was found on a man-made structure. This is a new record for this species in Virginia. Richman and Cutler (1978) report this spider from Ontario, Canada, New York, New Jersey, Pennsylvania, Wisconsin and Minnesota.

(25) *Thiodina sylvana* (Hentz). -This species inhabited most types of

vegetation except grasses. One mature female was collected on 6 July and four were collected on 17 and 23 August. Adult males were found throughout the summer from 31 May to 17 August. Two penultimate males matured in the lab on 23 August and 10 September. *Thiodina sylvana* spiderlings were extremely abundant in the field beginning in early July. The young spiders were easily recognized by the large black spots on the cephalothorax. Numerous specimens were returned to the lab for rearing. The spiderlings readily accepted food and water. Several became penultimate but none survived to maturity.

This is the first record of *Thiodina sylvana* in Virginia. Richman and Cutler (1978) suggest a range from North Carolina south to Florida.

(26) *Tutelina elegans* (Hentz). -A single mature female was beaten from honeysuckle growing on the banks of the James River on 7 July.

(27) *Tutelina similis* (Banks). -This species was found living on many types of vegetation, excluding grasses. Of four females captured prior to August, only one was mature. Two males were captured on 13 July. One male was feeding on an ant (Hymenoptera: Formicidae) when captured.

(28) *Zygoballus rufipes* Peckhams. -Seven of the 10 specimens caught were swept from fields overgrown with weeds and grasses. Two males were observed together on spearmint and one on pine bark. Mature males were found throughout the summer and fall from 8 June to 18 October. A penultimate male molted on 20 September. One female was collected mature on 18 July. Another molted 25 July and deposited an egg sac with seven eggs on 1 August. Since she was not mated, none of the eggs hatched. This species and *bettini* were described separately by the Peckhams. Edwards (1980) indicates they are synonymous based upon the genitalia. He concludes that *rufipes* is the correct species, since it has priority.

(29) *Zygoballus nervosus* (Peckhams). -All nine specimens captured were swept from open fields. On 17 October, five adult females and one male were taken from the same field. Other mature males were collected between 27 July and 18 October.

(30) *Zygoballus sexpunctatus* (Hentz). -Six adults, three of each sex, were found in fields between 14 June and 17 October. This presents a new record for Virginia.

DISCUSSION

Our study has revealed the presence of 18 genera and 30 species of salticids from the Virginia Peninsula (Table 1). However, based on known ranges of certain Salticidae species (Richman and Cutler, 1978), it is possible that other species occur on the peninsula.

Table 1. Salticid spiders from the Virginia Peninsula, habitat and site occurrence.

Species	No. of Specimens Collected	**Habitats	No. of Sites Located
<i>Admetina tibialis</i> (C.L. Koch)	1*	#	1
<i>Ballus youngii</i> (Peckhams)	1*	#	1
<i>Eris aurantia</i> (Lucas)	13	d	5
<i>Eris militaris</i> (Hentz)	9	b	3
<i>Habrocestum pulex</i> (Hentz)	4	b,c	3
<i>Hentzia mitrata</i> (Hentz)	8	b	5
<i>Hentzia palmarum</i> (Hentz)	93	d	8
<i>Lyssomanes viridis</i> (Walckenaer)	6	b	5
<i>Maevia inclemens</i> (Walckenaer)	1	#	1
<i>Marpissa lineata</i> (C.L. Koch)	3	#	1
<i>Marpissa pikei</i> (Peckhams)	2	#	1
<i>Metacryrba taeniola</i> (Hentz)	4	c	1
<i>Metaphidippus exiguus</i> (Banks)	16	b	8
<i>Metaphidippus galathea</i> (Walckenaer)	53	a,b,d	10
<i>Metaphidippus protervus</i> (Walckenaer)	27	b,d	6
<i>Peckhamia</i> sp.	2*	#	1
<i>Pellenes</i> sp.	1*	#	1
<i>Phidippus audax</i> (Hentz)	5	b,c,d	2
<i>Phidippus clarus</i> Keyserling	10	a,b,d	1
<i>Phidippus mystaceus</i> (Hentz)	6	b	1
<i>Phidippus otiosus</i> (Hentz)	2	#	1
<i>Phidippus princeps</i> (Peckhams)	2	#	1
<i>Phidippus whitmani</i> Peckhams	1	#	1
<i>Platycryptus undatus</i> (DeGeer)	18	b	10
<i>Sarinda hentzi</i> (Banks)	1*	#	1
<i>Sitticus fasciger</i> (Simon)	1	#	1
<i>Thiodina sylvana</i> (Hentz)	14	c,d	7
<i>Tutelina elegans</i> (Hentz)	1	#	1
<i>Tutelina similis</i> (Banks)	6	b,d	2
<i>Zygoballus rufipes</i> Peckhams	10	a	6
<i>Zygoballus nervosus</i> (Peckhams)	9	a	3
<i>Zygoballus sexpunctatus</i> (Hentz)	6	a	4
TOTAL	336		

*Immature specimens.

**a = open fields, b = saplings and/or under tree bark, c = man-made structures, d = vines and shrubs.

#Insufficient data to establish habitat.

Hentzia palmarum was the most frequently captured salticid (93 specimens, 8 sites). *Metaphidippus galathea* (53 specimens, 10 sites) and *Platycryptus undatus* (18 specimens, 10 sites) had wide distribution over the collecting area (Table 1).

Despite active collecting from May to October 1983, 14 species were represented by three or fewer specimens (Table 1). Four were larger

Phidippus species, known to live in trees. Upper tree limbs proved difficult to survey and this may have resulted in erroneous distribution data for these species. Conversely, minute genera such as *Admestina* and *Ballus* and ant-mimicking spiders may have been overlooked. Prolonged collecting might reveal a higher incidence of some species.

New salticid records for Virginia include *Phidippus princeps* (Peckhams), *P. otiosus* (Hentz), *Thiodina sylvana* (Hentz) *Sitticus fasciger* (Simon) and *Zygoballus sexpunctatus* (Hentz).

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BOOKS RECEIVED AND BRIEFLY NOTED

BEES AND THEIR KEEPERS. R.F. Trump. 1987. Iowa State Univ. Press. 171 pp. \$17.95.

The author's careful catalogue of scientific data about the honeybee and honey production is explained through homespun anecdotes and colorful observations in a casual, story-telling narrative style.

THE BEHAVIOURAL ECOLOGY OF ANTS. J.H. Sudd & N.R. Franks. 1987. Chapman & Hall. 206 pp. \$55.00 cloth, \$23.00 paper.

This book is concerned with how eusociality, in which one individual forgoes reproduction to enhance the reproduction of a nestmate, could evolve under natural selection, and why it is found only in some insects: termites, ants, and some bees and wasps.

BUMBLEBES. O.E. Prys-Jones & S.A. Corbet. 1987. Cambridge Univ. Press. 86 pp. \$24.95.

Number six in a series of British Naturalists' Handbooks. This small book deals with the natural history and identification of true bumblebees (*Bombus*) and cuckoo bumblebees (*Psithyrus*).

HOVERFLIES. F.S. Gilbert. 1986. Cambridge Univ. Press. 66 pp.

Number five in a series of British Naturalists' Handbooks. This small book deals with the natural history and identification of hoverflies.

THE BIOLOGY OF THE HONEY BEE. M.L. Einston. 1987. Harvard Univ. Press. 281 pp. \$29.95.

This broad treatment of honey bee biology probes the dynamics of the honey bee's social organization, including the complex infrastructure of the nest, the highly specialized behavior of workers, queens, and drones, and the remarkable ability of the honey bee colony to regulate its functions.

THE ULTRASTRUCTURE AND PHYLOGENY OF INSECT SPERMATOZOA. B.G.M. Jamieson. 1987. Cambridge Univ. Press. 320 pp. \$54.50.

Knowledge of sperm diversity can be useful in many fields. The primary aim of this work is to make available a critical resume of all research reports on the sperm of the Uniramia: Onychophora, Myriapoda, and Hexapoda, including the Insecta.